



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004HI55B

Title: Development of New Technique for use of Dissolved Helium as Environmental Groundwater Tracer

Project Type: Research

Focus Categories: Hydrology, Solute Transport, Models

Keywords: helium, tracer tests, instrumentation

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End Date: 02/28/2006

Federal Funds: \$24,000

Non-Federal Matching Funds: \$48,216

Congressional District: First

Principal Investigator:

Aly I. El-kadi

Abstract

The proposed study will build on the results of Phase 1 by developing and demonstrating the utility of helium and fluorescein tracer tests as a method of characterizing the transport properties of aquifers. Through laboratory and field experiments, we will develop the methodology to make more complete characterization of aquifer media transport properties possible. The final methodology developed will have commercial as well as scientific applications. We propose to conduct the following experiments:

- a dual tracer test in a tightly packed sand column filled with uniformly graded silica sand;
- a second sand column tracer test in an identical column packed with alternating layers of silica sand of different grain sizes;
- a third column experiment using uniformly graded silica sand as in the first column experiment but mixed with coralline gravel. The coralline gravel will have matrix diffusive properties that are much different than that of silica sand.

The results of the three column experiments will be analyzed to characterize the effects of different detection method used for each tracer, of contrasting hydraulic conductivity paths, and of contrasting media diffusion properties.

Once the data from the column experiments has been analyzed, a field experiment will be done using the same two tracers. This will be a push-pull tracer test in which injected and extracted from the same well. To aid in the design of the field test, a groundwater model will be developed to select the optimum injection rate, the optimum injection duration, and the optimum aquifer rest time. We expect to conduct a minimum three such tests. The first test is to refine the field methodology and gather initial data. Two more tests will be conducted, one in a fractured basalt aquifer and a second in a carbonate caprock aquifer. The exact location of the tests will be negotiated with potential site owners/operators.